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WASTE MANAGEMENT PROGRAM

Transmittal

5000 Cedar Plaza Parkway / Suite 211 / St. Louis, Missouri 63128 / 314-842-4550

To: Ms. Sandra Carroll
Missouri Department of
Natural Resources
205 Jefferson
Jefferson City, MO 65102

Date: April 12, 1989

File: 3050.005

Re: Annual Ground Water Report

Gentlemen: We are sending you X herewith _____ under separate cover

_____ drawings X descriptive literature _____ letters

Quan.	Identifying Number	Title	Action*
1	1988	Annual Ground Water Sampling Report	

*Action lettercode: **R**-reviewed **N**-reviewed and noted **I**-for your information **S**-resubmit **J**-rejected **Y**-for your approval

Remarks: Ms. Carroll, the annual report describing the ground water sampling activities at the Nixdorff site in Maryville, MO has been enclosed. This report meets the requirements of 40 CFR 265.94.

If you have any questions or comments concerning this report, please feel free to contact Joseph Fiala or myself at 314/842-4550.

If material received is not as listed, please notify us at once.

cc. Rich Nussbaum

Very truly yours,
O'Brien & Gere Engineers, Inc.

Kathryn James

Kathryn James

3050.005

1988

ANNUAL

GROUND WATER SAMPLING REPORT

FOR

NIXDORFF-LLOYD CHAIN COMPANY
MARYVILLE, MISSOURI

O'BRIEN & GERE ENGINEERS, INC.

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SECTION ONE - INTRODUCTION

1.01 General

The purpose of this report is to summarize the 1988 ground water sampling activities at the Nixdorff-Lloyd Chain Company facility located in Maryville, Missouri. Ground water samples were collected on a quarterly basis, and upon the completion of each sampling event, a quarterly report was prepared. Each report included a description of the sampling procedures, the analytical results and comparisons to previous data and drinking water standards.

1.02 Monitoring System

Twelve wells form the monitoring system at the Nixdorff-Lloyd facility. Four of these wells were originally installed in 1982 to fulfill RCRA ground water monitoring requirements for a surface impoundment (per 40 CFR 265 Subpart F). When the ground water indicator parameters appeared to increase, a Ground Water Quality Assessment Plan (GQAP) was developed and eight additional wells were installed. Ground water monitoring well (GMW) #1 is the farthest upgradient well and is located northeast of the former impoundment area. This well is actually located on property owned by the Missouri Highway and Transportation Department (MHTD) and a large pile of road salt was formerly stored near the well. Because of the uncertainty of the data from GMW #1 due to its surroundings, two additional upgradient wells were installed as part of the GQAP. One shallow well (GMW #5S) and one deep well (GMW #5D) were installed as a nested pair to provide additional background ground water quality data.

Additional wells were installed downgradient of the former impoundment area. Two deep wells, GMW #2D and GMW #4D, were installed as nested pairs to the original shallow wells GMW #2 and GMW #4. Additional wells were also installed as GMW #6S, GMW #6D, GMW #7 and GMW #8. A map which shows each of these well locations is included as Figure 1.

Due to previous damage to GMW #8, this well has been abandoned as a sampling and water level measuring location.

SECTION TWO - SAMPLING AND ANALYSES

2.01 Well Sampling Procedure

During each quarterly event, standard ground water sampling procedures were followed. These procedures are described below. Before the wells were sampled, the water level elevations were recorded. With this information, the quantity of water needed to remove three well volumes was calculated. Stainless steel bailers were used to remove at least three well volumes of ground water from each well. After each well was evacuated, the temperature, pH and specific conductivity of the ground water were measured in the field. After consistent field readings were achieved, a set of samples for laboratory analyses was then collected, preserved with analyte specific acids (where necessary), and cooled with ice. The ground water samples were then hand delivered to Environmental Analysis, Inc., located in St. Louis, Missouri.

Based on the history of the site and the GQAP, the ground water samples were analyzed for several parameters. Parameters used to determine ground water characteristics were pH, specific conductance, fluoride, nitrate, sulfate, chloride, total organic carbon (TOC) and total organic halogens (TOX). The samples were also analyzed for chromium, cyanide, iron, lead, mercury, nickel, sodium, and zinc. The results of the laboratory analyses from each well were summarized in each quarterly report. The original laboratory results are on file and available for inspection at O'Brien & Gere Engineers, Inc. in St. Louis, Missouri.

2.02 Analytical Results

The analytical results from each sampling event are reported in the Quarterly Ground Water Sampling Reports. Each well sample was analyzed for the following parameters: pH, Specific Conductivity, Total Organic Carbon (TOC), Total Organic Halogens (TOX), Chloride, Fluoride, Nitrate, Sulfate, Volatile Organics and Dissolved Metals (chromium, iron, lead, mercury, sodium, zinc). Each quarterly report contains a table of laboratory data, as well as an evaluation of the analytical results. The pH, SC, TOC and TOX values for each well from each quarter have been summarized in this annual report. The average (mean) and standard deviation (variance) have been calculated for each parameter, and these values are shown on Tables 3, 4, 5 and 6.

Since Nixdorff is currently in the process of establishing an approved ground water detection monitoring system at the Maryville site, further statistical calculations have not been performed. The new system will involve the installation of two new wells, and the MDNR and Nixdorff have agreed on a list of site specific parameters to use as statistical indicators. Upon approval of the new system, semi-annual sampling will begin and statistical analyses will then be completed.

2.03 Comparison To Drinking Water Standards

The analytical results obtained from the 1988 quarterly samples have been compared to the National Drinking Water Standards (NDWS) and the maximum permissible concentrations (MPCs) set by the USEPA. The ground water samples were tested for four constituents on the primary NDWS list, and most appeared to be within acceptable limits with a few exceptions.

During the second quarter, the NDWS limits were exceeded by the chromium concentrations in six of the ground water monitoring wells, however the levels found in the upgradient wells were greater than or equal to those observed in the downgradient wells. The chromium concentrations were within acceptable limits during all other sampling events.

The lead levels were below the NDWS maximum concentrations during each quarter, with the exception of two wells during the second quarter. One upgradient and one downgradient well exhibited elevated levels, however all other wells during this quarter were within acceptable limits.

In 1988, the secondary NDWS were exceeded by some of the parameters on the list, however these maximum permissible limits are only recommended levels. Chloride consistently exceeded the maximum recommended concentration (MRC) of 250 mg/l, in wells #4S, #5S and #5D. Since two of these wells are upgradient however, the elevated chloride levels are likely due to the large salt piles previously stored upgradient of the Nixdorff site.

Iron has also exceeded the MRC in many of the wells, both upgradient and downgradient, during the first and second sampling events of 1988. Since the iron levels were elevated in all wells during the first half of the year, and in none of the wells during the second half, it appears that the iron is due to a natural seasonal fluctuation in the ground water. Fluoride, sulfate and pH occasionally exceeded the recommended maximum concentrations of the secondary NDWS, however these elevated levels did not show a pattern, and were not replicated on a consistent basis.

2.04 Comparison to Previous Data

During the four quarters of 1988, some of the analytical results varied from well to well. In general, the parameters of cyanide, fluoride, nitrate, VOC, chromium, mercury, nickel, sodium, zinc, pH, TOC and TOX were generally stable between the four sampling events of 1988.

The chloride concentrations have remained relatively steady throughout 1988, and the same three wells (#4S, #5S and #5D) have exhibited consistently elevated levels. The sulfate concentrations have also remained steady, while wells #2S and #4S have exhibited elevated levels during all four quarters. Iron content in all the wells showed a decrease between the 1st and 2nd quarters compared to the 3rd and 4th quarters, and the lead concentrations also decreased during the second half of 1988.

SECTION THREE - WATER LEVEL DATA

Measurements of the ground water elevations were taken at the time of each sampling activity. The water levels were measured from the top of the PVC well casing and are stated as elevations based on the elevations of the top of each well casing. This data is used to determine the horizontal ground water gradient for the area. Based on these values, the ground water flows approximately in a east-southeasterly direction. Figure 1 shows the approximate ground water flow.

Due to excessive drought conditions in 1988, ground water elevations have dropped considerably. Between second quarter, 1988 and third quarter, 1988, water elevations dropped approximately 2 feet. Between the third and fourth quarter however, the ground water elevations stabilized.

TABLE 1

NATIONAL DRINKING WATER STANDARDS
40 CFR 141.11

CONSTITUENT	MAXIMUM PERMISSIBLE CONCENTRATION (mg/l)
Arsenic	0.05
Barium	1.
Cadmium	0.010
Chromium	0.05
Fluoride	4.0
Lead	0.05
Mercury	0.002
Nitrate (As N)	10.
Selenium	0.01
Silver	0.05

TABLE 2

NATIONAL SECONDARY DRINKING WATER STANDARDS
40 CFR 143.3

CONSTITUENT	MAXIMUM RECOMMENDED CONCENTRATION (mg/l)
Chloride	250.
Copper	1.
Fluoride	2.0
Foaming Agents	0.5
Iron	0.3
Manganese	0.05
Sulfate	250.
Total Dissolved Solids (TDS)	500.
Zinc	5.
OTHER	
Corrosivity	Noncorrosive
Odor	3 threshold odor number
pH	6.5-8.5 S.U.

Table 3

pH ANNUAL RESULTS

Nixdorff-Lloyd Chain Company

	GMW #1	GMW #2S	GMW #2D	GMW #3	GMW #4S	GMW #4D	GMW #5S	GMW #5D	GMW #6S	GMW #6D	GMW #7
1st Qtr	7.1	6.6	6.5	6.7	6.9	6.9	6.8	6.8	6.8	6.6	6.7
	7.2	6.7	6.7	6.7	7.0	6.9	6.9	6.7	6.5	6.5	6.7
	6.8	6.8	6.6	6.6	6.8	7.0	6.9	6.7	6.5	6.5	6.7
	6.8	6.8	6.6	6.6	6.9	6.9	6.9	6.7	6.6	6.4	6.7
2nd Qtr	6.7	6.5	6.7	5.4	5.0	5.0	6.6	6.4	6.9	6.5	5.4
	7.1	6.6	6.7	5.4	5.0	5.0	6.5	6.4	7.0	6.6	5.4
	7.1	6.6	6.7	5.4	5.0	5.0	6.7	6.6	7.0	6.6	5.4
	7.1	6.7	6.7	5.4	5.0	5.1	6.7	6.6	7.0	6.6	5.3
3rd Qtr	6.7	6.5	7.0	6.6	6.5	6.7	6.6	6.5	7.1	7.0	6.8
	6.8	6.5	7.0	6.3	6.5	6.7	6.6	6.5	7.0	7.0	6.9
	6.9	6.5	6.7	6.5	6.5	6.7	6.6	6.6	7.0	6.9	6.9
	6.9	6.5	6.8	6.5	6.4	6.4	6.7	6.6	7.0	7.0	6.9
4th Qtr	6.9	7.0	7.3	6.5	5.9	6.7	6.8	7.0	7.0	7.5	7.3
	6.9	7.0	7.0	6.4	5.8	6.6	6.8	7.0	7.0	7.3	7.2
	6.9	7.0	7.0	6.4	5.8	6.5	6.8	6.9	7.2	7.2	7.2
	6.9	7.0	7.0	6.4	5.8	6.4	6.8	6.9	7.4	7.2	7.2
Average	6.9	6.7	6.8	6.2	6.1	6.3	6.7	6.7	6.9	6.8	6.5
Standard Deviation	0.2	0.2	0.2	0.5	0.7	0.8	0.1	0.2	0.2	0.3	0.7

Table 4

SPECIFIC CONDUCTIVITY ANNUAL RESULTS

Nixdorff-Lloyd Chain Company

	GMW #1	GMW #2S	GMW #2D	GMW #3	GMW #4S	GMW #4D	GMW #5S	GMW #5D	GMW #6S	GMW #6D	GMW #7
1st Qtr	290	710	550	500	1300	620	1000	850	350	340	350
	320	690	580	510	1400	620	1100	800	360	350	360
	300	650	580	530	1500	630	1100	800	370	350	360
	300	650	580	530	1500	630	1100	800	370	350	370
2nd Qtr	350	860	720	720	1600	690	1000	790	350	350	340
	360	880	720	730	1600	660	1100	810	340	340	340
	360	880	720	730	1600	720	1100	800	340	340	340
	360	920	720	730	1600	700	1200	800	340	340	340
3rd Qtr	350	1100	740	800	2000	820	1160	645	380	420	320
	350	1100	740	790	2000	780	1170	650	380	410	320
	360	1110	750	790	2000	845	1180	620	380	410	320
	360	1100	750	780	2000	850	1180	625	390	410	320
4th Qtr	500	1500	1000	1100	3900	1400	1700	1100	600	600	400
	500	1500	1000	1000	3950	1400	1700	1000	600	600	400
	500	1500	1000	1000	3950	1350	1700	1000	600	600	400
	500	1500	1000	1000	3950	1200	1700	1000	600	600	400
Average	379	1041	759	765	2241	870	1262	818	422	426	355
Standard Deviation	76	316	159	188	1035	292	267	145	107	108	31

Table 5

TOC ANNUAL RESULTS

Nixdorff-Lloyd Chain Company

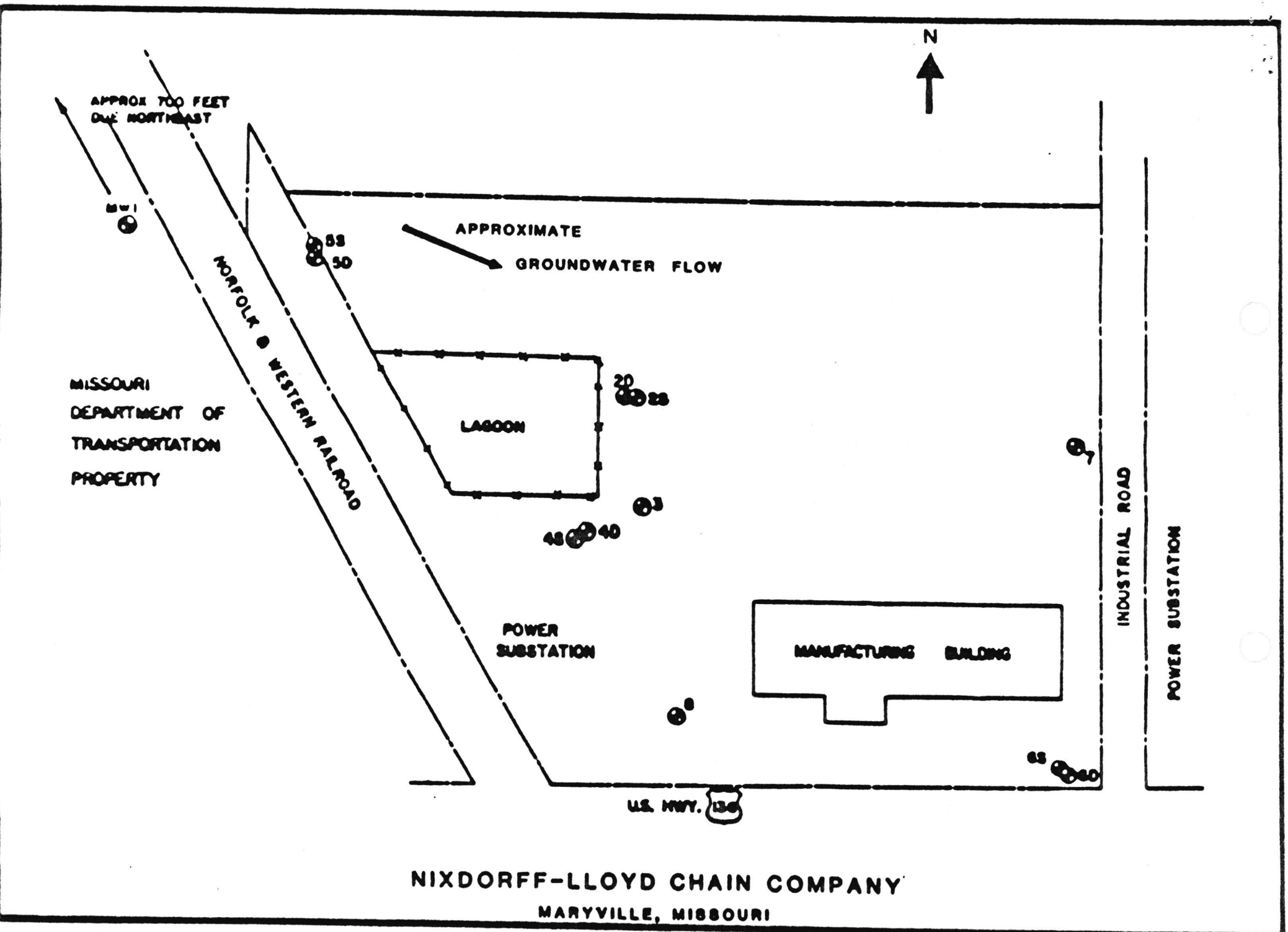
	GMW #1	GMW #2S	GMW #2D	GMW #3	GMW #4S	GMW #4D	GMW #5S	GMW #5D	GMW #6S	GMW #6D	GMW #7
1st Qtr	2.98	3.84	5.07	9.89	8.44	6.96	4.18	4.18	7.14	8.92	4.10
	2.73	3.92	4.75	9.42	8.34	7.24	4.22	4.22	7.27	8.94	4.02
	3.39	3.58	5.11	9.54	8.32	7.27	4.16	4.16	7.26	9.31	4.55
	3.09	3.64	5.07	9.28	8.27	6.86	3.88	4.63	7.02	8.45	4.27
2nd Qtr	4.34	5.66	3.54	4.62	8.98	2.09	3.66	2.20	3.84	4.09	4.54
	4.59	6.14	3.36	4.64	9.05	2.19	3.72	2.05	3.25	4.36	4.54
	4.11	5.30	3.48	4.68	8.85	2.92	3.36	2.66	4.29	4.41	4.53
	4.48	5.55	3.26	4.62	7.21	2.95	3.20	2.56	4.48	4.05	4.84
3rd Qtr	13.6	8.53	6.16	7.62	9.71	6.35	4.94	2.17	7.13	6.37	6.75
	16.2	8.62	6.51	7.76	10.30	5.87	4.29	2.06	6.69	8.19	8.58
	15.6	8.46	6.29	6.90	9.73	6.63	5.57	2.19	6.38	8.40	7.59
	15.3	9.60	6.34	7.21	8.25	5.93	3.85	2.83	7.01	7.12	7.17
4th Qtr	2.65	1.99	1.31	2.13	8.49	1.62	1.70	0.87	2.86	2.39	3.57
	2.34	1.98	1.80	2.43	7.14	1.57	2.28	0.90	3.21	3.10	3.26
	2.34	1.73	1.64	2.23	7.99	2.15	2.70	0.99	2.90	3.03	2.70
	2.71	1.86	1.86	2.36	6.23	1.52	2.77	1.03	2.97	3.45	3.11
Average	6.28	5.03	4.10	5.96	8.46	4.38	3.66	2.48	5.23	5.91	4.88
Standard Deviation	5.38	2.66	1.81	2.84	1.03	2.39	0.98	1.25	1.88	2.52	1.72

Table 7

TOX ANNUAL RESULTS

Nixdorff-Lloyd Chain Company

	GMW #1	GMW #2S	GMW #2D	GMW #3	GMW #4S	GMW #4D	GMW #5S	GMW #5D	GMW #6S	GMW #6D	GMW #7
1st Qtr	<0.01	<0.01	0.03	0.08	0.04	0.01	0.03	0.03	<0.01	0.02	<0.01
	<0.01	0.02	0.03	0.09	0.03	0.01	0.04	0.05	<0.01	0.01	<0.01
	<0.01	0.02	0.03	0.09	0.03	0.01	0.05	0.04	<0.01	0.01	<0.01
	<0.01	0.01	0.03	0.09	0.03	0.01	0.06	0.01	<0.01	0.01	<0.01
2nd Qtr	0.01	0.03	0.02	0.04	0.07	0.02	0.03	<0.01	0.04	0.03	0.01
	0.01	0.04	<0.01	<0.01	0.07	0.01	0.02	0.03	0.03	<0.02	<0.01
	0.01	0.05	<0.01	<0.01	---	0.01	---	0.05	0.03	<0.01	<0.01
	0.01	0.05	<0.01	<0.01	---	0.01	---	0.033	0.01	<0.01	<0.01
3rd Qtr	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	<0.01	<0.01	<0.01	0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	<0.01	<0.01	<0.01	0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4th Qtr	<0.01	0.03	0.01	<0.01	0.05	0.05	<0.01	0.02	<0.01	0.02	<0.01
	<0.01	0.02	0.01	<0.01	0.04	0.04	<0.01	<0.01	<0.01	0.02	<0.01
	<0.01	0.01	<0.01	<0.01	0.03	0.02	<0.01	<0.01	<0.01	0.02	<0.01
	<0.01	0.01	<0.01	<0.01	0.02	0.02	<0.01	<0.01	<0.01	0.02	<0.01
Average	<0.01	0.02	<0.02	<0.03	0.04	0.02	<0.02	<0.02	<0.01	<0.02	<0.01
Standard Deviation	0	0.01	0.01	0.03	0.02	0.01	0.02	0.02	0.01	0.01	0



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